Technical Requirements

Direct participation in a NASA Digital Learning Network™ event is possible through interactive video or web conferencing. In order to participate in a DLN interactive video or web conference, you will need either a **video conference** codec (coder / decoder) that uses standards-based operating over a high-speed Internet connection (IP) or a **web conference** capable computer. Please indicate if you would like to use Video or Web Conferencing as your delivery medium when registering for an event.

More about Video Conferencing over IP

IP which stands for **I**nternet **P**rotocol is an identifier for a computer or device on a TCP/IP network. Networks using the TCP/IP protocol route traffic based on the IP address of the destination. The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. Each number can be zero to 255. For example, 1.160.10.240 could be an IP address. The (ITU) H.323 data format, a compression algorithm that provides consistent packet transmission of audio, video, and data across networks, is the **standard** for video conferencing over IP. IP video conferencing also produces higher quality events that have minimal technical interruptions, clearer pictures and better audio. Schools should consider:

- The DLN uses a standard connection rate of 384kbps (kilobits per second) or higher. Your location may want to arrange for increased bandwidth of 512kbps or 768kbps (40% overhead from these rates should be allowed when requesting IP bandwidth).

- Ability to "Dial Out" and have others "Dial In" (place outbound and receive inbound) calls.

- Symmetrical bandwidth allocation (same bandwidth inbound & outbound).

- For the IP mode, location of the systems on a subnet outside the firewall. However, if using IP technology and the system will be placed behind a firewall, access should be allowed locally through the firewall. All firewalls must be protocol aware. Your system administrator should assist with this process. (Additional details are given below.)

- Multisite capability is optional but may be necessary if you plan to collaborate directly with more than one site.

- Webcast participation is available through the DLiNfo Channel. One computer and a projection device or a computer lab allows for student interaction via chat forum or email.

A **firewall** is a set of related programs (located at a network gateway server) that protects the resources of a private network. Basically, a firewall, working closely with a router program,

filters all network packets to determine whether to forward them toward their destination. A firewall is often installed away from the rest of the network so that no incoming request can access private network resources. There are a number of firewall screening methods. A simple one is to screen requests to make sure they come from acceptable (previously identified) domain names and IP addresses. **Your Systems Administrator or Network Supervisor should consult with the manufacturer of your specific video conferencing system to obtain port settings to allow access through your firewall for your IP video conference equipment.**

Firewall port settings must be correctly set to allow H.323 videoconferencing over IP. The firewall settings are ports that must be opened in the network security system or "firewall". If these ports are not open, the connection that will be available over the IP network may not allow the video conference data to pass properly. This could result in: (1) a failure to establish a connection, (2) a very brief connection and then loss of connection, or (3) freezing during the connection. It is important to understand that by opening these ports, you are punching holes in your firewall, which reduces the protection the firewall provides.

CAUTION: For this reason, we recommend that your network administrator review these settings and that only qualified IT personnel make these changes. You will be enabling access to ports 1024+. This puts almost all third party TCP based products in vulnerable mode.

Below is a list of minimum ports that must be enabled for H.323 videoconferencing to work.

Port	Open	Explanation
1719	UDP	Call setup if you use a gatekeeper
1720	TCP	Call setup and negotiation
Range of ports	TCP and/or UDP	Dependent on CODEC manufacturer - Video & Audio stream data is negotiated over port ranges as manufacturers determine.
80		HTTP Server - some systems use for web control.
1024 thru 65535		All outbound high ports should be open.

More about Web Conferencing

DLN events are also offered through web conferencing. For those schools that use mobile or computer-based technology, the DLN has access to VidyoWeb, a web browser-based program that allows schools to use their web cameras to connect with our DLN studio. Schools that use

PC/Mac-based technologies can connect to us via the web.

With web conferencing, an ethernet connection is preferred over Wi-Fi. We also recommend that you connect your computer to a projection system to enable students to see the presenter more clearly and allow for greater interaction. The computer you use with a web conferencing connection should also be attached to amplified speakers or a PA system if your session is in a space larger than a classroom. An external microphone is typically better than a webcam microphone. A wireless microphone system connected to your computer would provide the good quality and portability to facilitate students' comments and questions. Another option is a centrally located microphone that students walk up to within the camera view. Keep in mind that the quality of visual and audio in web conferencing is less than a standard video conference.